THE MARINE AIR TRAFFIC CONTROL SQUADRON: UNDERTAXED IN THE MACCS

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OUTLINE

Thesis: By procuring some currently available, lightweight equipment and emphasizing different aspects of employment, the MATCS can become a mobile and survivable player in any battlefield environment.

Introduction: The Need for a More Mobile and Survivable MATCS

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   A. Relationship to the Marine Air Control Group (MACG)
   B. Use of the Marine Air Command and Control System (MACCS)
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Corporal Schmuck felt good as he stretched his legs after the three-hour ride in the dark. He would have felt even better if he had thought he could hit the rack soon, but he knew there was a job to do first. The small Marine Air Traffic Control Squadron (MATCS) detachment had brought enough gear to establish a remote landing site. Lieutenant Hardcharger, the MATCS det officer, quickly selected, surveyed, and marked the site for sequencing arriving and departing aircraft within their assigned airspaces. He then proceeded to show Corporal Schmuck where to set up the remote site landing tower (RLST). Schmuck drove to the location, and because each person in the det knew his part thoroughly, set-up went without a hitch. The RLST and the AN/TPN-30B approach landing system were set up, and the radios were op-checked--all within 30 minutes. After he was done, Schmuck smiled to see his crew had beaten the engineers--they were still working on the last few improvements to the landing site. "I win another beer for being ready to receive aircraft before Bosco and his engineer weenies again, plus I'll snag the best sleeping spots!" Corporal Schmuck grinned and stretched as he waited for the Lieutenant to check the set-up, knowing that he would probably be hitting the rack

within twenty minutes.

Is this scenario, depicting a tactically mobile air traffic control operation, realistic? The success of wartime air power could depend on it. Yet the squadron that attempts to fulfill this role, the Marine Air Traffic Control Squadron (MATCS), is often accused of having no tactical survivability. This radar and radio-dependent operation is very likely to be top priority on an enemy's target list. It follows then that the MATCS must be highly mobile in order to survive. It must also be capable of operating in a non-radar environment, and its Marines must be highly trained in every facet of its quick set-up, operation, and displacement. (2:60)

Unfortunately, these are not generally the case. The primary tool used by the MATCS, the Marine Air Traffic Control and Landing System (MATCALS), is "the product of officers and industry whose collective experience of warfare centers on the unchallenged air supremacy of the Vietnam conflict." (2:60) The system is heavy, expensive, extremely technical, and is representative of many other tools used within the MATCS for accomplishment of its mission. The heavy investment required to lift, move, and support the MATCS, with all its equipment and personnel, has created a tendency to under-utilize the MATCS--even to the point of leaving it behind on all but the largest exercises. As

Marines are most likely to be called into action for low intensity conflict (LIC) and mid-intensity conflict (MIC) crises (18:2), the battlefield usefulness of the MATCS, as it exists now, is extremely limited. Yet this situation can be rectified. By procuring some currently available, lightweight equipment and emphasizing different aspects of employment, the MATCS can become a mobile and survivable player in any battlefield environment.

BACKGROUND: THE MARINE AIR TRAFFIC CONTROL SQUADRON

The MATCS is a small but integral part of Marine Corps aviation. Along with several other squadrons and battalions, it falls under the purview of the Marine Air Control Group, or MACG (Figure 1). (16:1.3) The wide range of differing tasks performed by the units within the MACG would present a Marine Air-Ground Task Force (MAGTF) commander with an unmanageable command and control nightmare were they not organized into a single, integrated system. This system, the Marine Air Command and Control System (MACCS), allows a MAGTF commander to exercise command and control of his various aviation assets. (16:2.3-4) The MATCS relies heavily on the MACCS to gain information from other MACG organizations and also to disseminate information as necessary for mission accomplishment.

The mission assigned to the MATCS is to "provide air

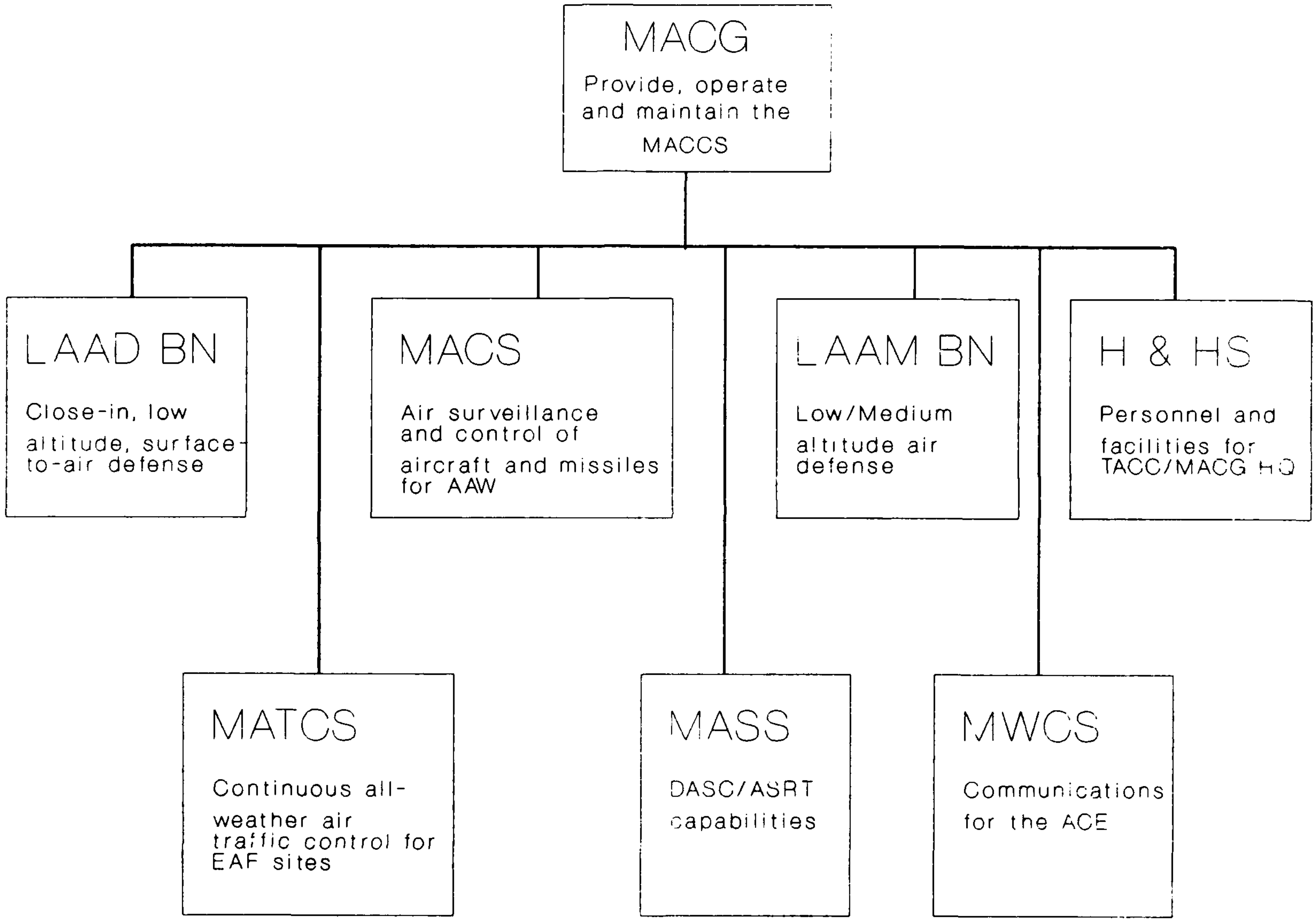

Figure 1. MACG Organizations and Tasks*

*** See Appendix A for Acronym Definitions**

traffic control service at expeditionary airfields and remote landing sites under all-weather conditions in support of the Fleet Marine Force (FMF)." (19:30) The MATCS accomplishes this mission through seven formal tasks as stated in Fleet Marine Force Manual (FMFM) 5-1, Marine Aviation:

1. Install and operate air traffic control (ATC) and navigational systems required for the control of aircraft at expeditionary airfields (EAF's) and remote landing sites.

2. Provide ATC service for the safe, orderly, and expeditious flow of aircraft within designated terminal/landing areas. Maintain a capability to exchange ATC information within the MACCS and external/controlled agencies.

3. Advise the MACG commander on matters pertaining to ATC.

4. Advise the MACG commander on the employment of Marine ATC teams/units.

5. Maintain the capability to deploy and operate as an integral unit.

6. Maintain the capability to deploy independent ATC teams/units.

7. Provide an interface with local national and/or international civil ATC agencies. (19:30)

Essentially, the MATCS is designed to provide air traffic control services anytime, anywhere.

The MATCS's expeditionary ATC services are provided to expeditionary airfields via MATCS detachments, or "dets." These dets provide task-organized support to accomplish the assigned mission. When employed at the Marine Expeditionary Force (MEF) level, MATCS detachments can provide Instrument Flight Rule (IFR)-capable expeditionary ATC services for up to four expeditionary airfields, as well as limited support at remote landing sites. When employed in support of a Marine Expeditionary Brigade (MEB), MATCS detachments can provide IFR-capable expeditionary ATC services for up to two expeditionary airfields, and limited support at remote landing sites. Expeditionary ATC support for Marine Expeditionary Unit (MEU) operations is scenario dependent. Air traffic controllers also deploy with each MEU(Special Operations Capable) and are capable of assuming control of helicopters and fixed wing aircraft in support of ground forces. (16:6.1-3)

MATCS LIMITATIONS

Up to this point, the MATCS appears properly task organized according to the size and needs of the supported unit. Unfortunately, this apparent flexibility is deceiving. As described in the following discussions, the MATCS has some serious problems to overcome before it can provide the efficient expeditionary support implied in its mission

statement.

LIMITATION #1: THE MARINE AIR TRAFFIC CONTROL AND LANDING SYSTEM (MATCALS) "FOOTPRINT"

Extensive air operations in limited airspace and inherent human limitations in simultaneously monitoring and directing multiple aircraft have created the need for high-tech ATC equipment. The difficult aircraft recovery phase is complicated by the relatively low fuel state of aircraft returning from missions, the high rate of fuel consumption during landings, and the intermixing of slower aircraft (helicopters, OV-10's, etc.) with the higher performance jet aircraft. (20) The MATCS task of providing a safe, orderly, and expeditious flow of air traffic presents a huge challenge. The MATCALS was developed to meet this challenge. This partially automated system uses state-of-the-art computers and software to assist controllers in guiding and monitoring aircraft. The MATCALS now provides the air traffic controller with the following capabilities:

* data collection, evaluation, and display
* information dissemination
* terminal airspace management
* base defense zone grid depiction
* airspace boundaries depiction
* extensive communications

Unfortunately, the extensive capabilities of the MATCALS come with a high logistical cost to the MAGTF commander. The MATCALS equipment has an enormous "footprint" (i.e., its combined size and weight) and makes up a large portion of the MATCS gear (TABLE I).

TABLE I

NOTIONAL MATCS DETACHMENT (17:5.11)

AN/TPN-30 (or AN/TPN-30B)	Marine Remote Area Approach Landing System (MRAALS)
AN/TRN-44	Tactical Air Navigation (TACAN) system
AN/TSQ-120	portable control tower
MATCALS	Marine Air Traffic Control and Landing System
- AN/TSQ-107B	air surveillance radar (currently being replaced by the enhanced radar, AN/TPS-73)
- AN/TPN-22	precision approach radar
- AN/TSQ-131	automated approach control shelter

The MATCALS assets of one MATCS det, to include supporting equipment and personnel, support only a single EAF (17:5.11), and yet require approximately fifteen C-130 lifts or seven C-141 lifts to deploy to an operational area. The majority of this embarkation space is required for just MATCALS equipment. (2:60) Each additional EAF requires still another complete MATCS detachment and the associated lift to support it. The seriousness of the MATCALS size and weight

problems becomes even more apparent when one considers the scarcity of embarkation space available for even large-scale operations. Its sheer size often leaves commanders with no choice but to leave the MATCS behind due to limited embarkation space.

LIMITATION #2: BATTLEFIELD MOBILITY

When the MATCS deploys with a unit in spite of its size and weight drawbacks, it proves lacking on yet another front. Once on the battlefield, the MATCS is not survivable, especially in LIC or MIC arenas. Due, once again, to its large footprint, the MATCS does not have the mobility so crucial to wartime survival. LIC and MIC arenas, in particular, will require the MATCS to operate from austere airfields or roads under all weather conditions, with the ability to quickly and regularly displace to new operational sites. (18:6-13) These remote landing sites (RLS's) or slightly larger Forward Operating Bases (FOB's) enhance responsiveness through basing flexibility, dispersal of aircraft, and reduced distances to areas requiring air support. Yet when deployed as a full system, MATCALS is not small, lightweight, tactical, or able to rapidly displace to RLS's and FOB's. Once the entire system is emplaced and set up, it involves considerable efforts to tear down and displace, with approximately ten hours until it is fully

operational again. This lack of mobility seriously reduces the detachment's chances of surviving. An enemy is bound to target non-mobile airfields. Therefore, if the MATCS is to be utilized in LIC and MIC arenas, it is crucial that its assets be made lightweight and mobile.

LIMITATION #3: BATTLEFIELD SURVIVABILITY

If an enemy does not choose or have the ability to physically destroy the MATCS detachment and its assets, a non-mobile detachment and airfield still provide a prime target for electronic warfare (EW). The MATCALS is a fully radar and radio-dependent operation, making it particularly susceptible to this threat. An enemy can easily use directional jamming to render useless the receivers of a stationary MATCS detachment. Its lack of mobility also enables the enemy to use direction finding (DF) equipment as a guide for shelling or calling air strikes upon the detachment almost at will. With no tactical mobility to avoid the EW threat, the MATCS det is left a sitting duck. It becomes primarily a matter of time before the MATCS det will be impaired or rendered completely ineffective.

RECOMMENDATIONS

Is there a solution to this maze of MATCS stumbling blocks? Actually, there are as many solutions as there are

people willing to tackle the problems. MATCS capabilities are generally seen as equipment-driven; however, any viable solution to MATCS problems must involve more than just quick fixes to equipment deficiencies. New equipment or modifications to existing equipment may have an impact upon personnel training requirements, number of personnel required to accomplish the mission, procedures, logistical support, and overall mode of operations. (7) The following recommendations in the areas of MATCS equipment and employment combine to form an integrated solution addressing MATCS limitations.

MATCS EQUIPMENT

Because the issue of MATCS deployment is so often associated with the MATCALS's large footprint (2), it causes the MATCS to be perceived as under-utilized, non-mobile when it IS utilized, and non-survivable as a result of its lack of mobility. Because of this, the size and weight of the MATCALS footprint must be reduced. This task is not as monumental as it may initially appear. First of all, it is necessary to rethink the structure of the MATCS detachment. To do this, the type of ATC services required must be identified. If a precision approach capability is to remain a requirement, does this mean the entire MATCALS has to be deployed? It certainly does not. A precision approach

capability can be attained with only the AN/TSQ-107 surveillance approach radar and one AN/TSQ-131 shelter. This is only one of many possible configurations which could greatly reduce the tactical lift requirements of the MATCS detachment, while still allowing for enhanced airfield support. Although it is not currently perceived as such, MATCALS can be an extremely flexible system, task-organized to provide the degree of services required. So what happens if the tactical situation precludes ANY use of MATCALS? Depending on the situation and degree of sustainability required, a small MATCS det could be loaded into two or three High Mobility Multi-purpose Wheeled Vehicles (HMMWV's). Despite its small size, this det could still provide tremendous all-weather ATC services. The equipment recommended for achieving this mobility and functionality is currently available or is being considered for purchase. It consists of the following items:

(1) **AN/GRC-206 (HMMWV-mounted):** Remote Landing Site Tower (RLST) (4),(10)

(2) **AN/TPN-30B:** TACAN-modified MRAALS navigational aid (6)

(3) **GPS:** Global Positioning System (3),(11)

These three items of equipment can provide an RLS or FOB with all the mobile ATC services required on two HMMWV's.

The RLST is currently a non-developmental item candidate

being reviewed by the Marine Corps Research, Development, and Acquisition Command (MCRDAC) for purchase. It primarily replaces the AN/TSQ-120 which must be externally lifted by CH-53 for any type of quick displacement. (4:1-5) The RLST is the most mobile and logistically supportable method of providing Visual Flight Rule (VFR) service to aircraft at RLS's or FOB's. The RLST, in conjunction with the AN/TPN-30B, allows all-weather ATC operation within an assigned airspace. It is lightweight, air deliverable, and can displace and set up within fifteen minutes after arrival. The AN/GRC-206 provides a single communications package which covers all frequency bands routinely used by a MATCS, and it allows operation by remote control. It can operate by commercial power, vehicular power, or generator. Further, it enables controllers to talk on the move.

The AN/TPN-30B supplies another important piece of the mobile MATCS concept. The original AN/TPN-30 is a portable microwave landing system (MLS) which provides a passive precision azimuth and glideslope to suitably equipped aircraft. The AN/TPN-30B adds TACAN capability to the existing MLS capability, adding only ten pounds to the originally 120-pound item. (6:1-4) This updated system transmits azimuth and elevation data for all-weather precision guidance from ten nautical miles (nm) down to a weather minimum of a 100-foot ceiling and a one-quarter

statute mile visibility. This system also possesses distance measuring equipment (DME), range, and TACAN azimuth capability for all-weather, non-precision guidance from 40 nm down to a weather minimum of a 500-foot ceiling and one-half statute mile visibility. Perhaps most crucial, however, is the AN/TPN-30B's capability for electronic counter-measures (ECM) protection-it remains silent until interrogated by an aircraft. Seventy-nine of the original AN/TPN-30's are currently in the FMF without the new TACAN modification. The modification has been scheduled for installation during the systems' next period of depot-level maintenance.

The Global Positioning System is a man-portable or vehicle-mounted system that receives signals from the Navigational Satellite Tracking and Ranging (NAVSTAR) satellite constellation to provide a user with precise information on his position. The system requires minimal set up and is powered by a standard BA-5590 military battery or by vehicular power. This completely passive system establishes both the horizontal and vertical position of the user. (3:3-7) GPS provides either latitude, longitude, or military grid reference system coordinates and elevation in feet or meters above the mean sea level (MSL). Each MATCS was scheduled to receive fifteen GPS NAVSTAR systems in a planned allowance during FY-90. Each RLST system will be equipped with a GPS for rapid instrument approach and

departure procedure development.

These three items provide the MAGTF commander great flexibility in maneuvering his air assets to meet a dynamic scenario. In particular, the lift requirements for a MATCS FOB or RLS detachment are reduced to one C-130 or external lift by one CH-53E. These mobile airfields can now deny the enemy a fixed target due to their ability to operate for a short period and then displace. Additionally, the ground commander now has aviation assets available with more time on station due to reduced enroute flight time.

MATCS EMPLOYMENT AT REMOTE LANDING SITES

Regardless of how small or mobile an RLS or FOB is, it must still have access to the MACCS to function. This can be accomplished via organic communication links to the Tactical Air Command Center (TACC) afloat or ashore. All-weather operation within an assigned airspace can be conducted from the HMMWV-mounted RLST. A manual approach-qualified air traffic controller will identify and sequence arriving aircraft within the assigned airspace. The approach controller will then hand-off the arriving aircraft to a tower-qualified air traffic controller for sequencing and landing instructions. The tower controller will position himself on terrain (natural or manmade) that affords the best field of view.

The mobile RLS or FOB will travel over existing road networks with a low-altitude air defense (LAAD) battalion stinger section in general support. The ground defense will be provided from organic assets and crew-served weapons. The MATCS det officer will select, survey, and mark the landing site; among his considerations for site selection will be the ten nm FOB defense zone. He must also coordinate closely with the LAAD section leader, as the MATCS det must provide the LAAD section with the range, bearing and number of aircraft inbound. If the RLS or FOB is to be upgraded to an EAF, then the MAGTF commander may choose to assign a light anti-air missile (LAAM) battalion assault fire unit in general support for protection from hostile air attack. (9)

Concurrently, the AN/TPN-30B will be placed into operation. A Terminal instrument Procedures (TERPS)-qualified air traffic controller will then review the established return-to-force corridor and develop a TACAN approach to the base defense zone safe lane. Engagements of enemy aircraft outside the safe lane will be determined by hostile aircraft identification criteria and the established rules of engagement. (9)

Because of the services it can provide, the MATCS is an extremely valuable asset to have available in any wartime environment. MAGTF commanders should have the ability to

utilize MATCS capabilities with RLS's and FOB's even when the tactical situation calls for rapid displacement. Yet because of the high logistical cost of embarking the MATCALS, the lack of tactical mobility of the MATCS dets, and the poor chances of MATCS survival in wartime, the MAGTF commander is often left no choice but to deploy without MATCS support.

Fortunately, the solution is within reach. The foundation of a lightweight, mobile, and survivable MATCS detachment lies in the employment of equipment that is currently available or is being considered for Marine Corps purchase. Through use of the HMMWV-mounted AN/GRC-206 remote landing site tower, the AN/TPN-30B TACAN-modified navigational aid, the Global Positioning System, and employment techniques coordinated with other MACCS agencies, the MATCS det will gain the ability to displace rapidly and complete set-up in approximately fifteen minutes of arrival at a new site. This new tactical mobility, as well as coordinated support from the LAAD and LAAM battalions, helps to ensure the det's chances of survival in wartime.

The MATCS must learn to look beyond the heavy support required during the Vietnam War, and refocus on the requirements of today's LIC and MIC arenas. If the MATCS chooses not to make this adjustment, it will surely find itself increasingly "undertaxed in the MACCS."

APPENDIX A

GLOSSARY OF ACRONYMS

AAW	ANTI-AIR WARFARE
ACE	AIR COMMAND ELEMENT
ASRT	AIR SUPPORT RADAR TEAM
ATC	AIR TRAFFIC CONTROL
DASC	DIRECT AIR SUPPORT CENTER
DF	DIRECTION FINDING
DME	DISTANCE MEASURING EQUIPMENT
EAF	EXPEDITIONARY AIRFIELD
ECM	ELECTRONIC COUNTER-MEASURES
EW	ELECTRONIC WARFARE
FMF	FLEET MARINE FORCE
FMFM	FLEET MARINE FORCE MANUAL
FOB	FORWARD OPERATING BASE
GPS	GLOBAL POSITIONING SYSTEM
H&HS	HEADQUARTERS AND HEADQUARTERS SQUADRON
HMMWV	HIGH MOBILITY MULTI-PURPOSE WHEELED VEHICLE
IFR	INSTRUMENT FLIGHT RULE
LAAD	LOW-ALTITUDE AIR DEFENSE
LIC	LOW INTENSITY CONFLICT
MACCS	MARINE AIR COMMAND AND CONTROL SYSTEM
MACG	MARINE AIR CONTROL GROUP
MACS	MARINE AIR CONTROL SQUADRON
MAGTF	MARINE AIR-GROUND TASK FORCE
MASS	MARINE AIR SUPPORT SQUADRON
MATCALS	MARINE AIR TRAFFIC CONTROL AND LANDING SYSTEM
MATCS	MARINE AIR TRAFFIC CONTROL SQUADRON
MCRDAC	MARINE CORPS RESEARCH, DEVELOPMENT, AND ACQUISITION COMMAND
MEB	MARINE EXPEDITIONARY BRIGADE
MEF	MARINE EXPEDITIONARY FORCE
MEU	MARINE EXPEDITIONARY UNIT
MEU(SOC)	MARINE EXPEDITIONARY UNIT (SPECIAL OPERATIONS CAPABLE)
MIC	MID-INTENSITY CONFLICT
MLS	MICROWAVE LANDING SYSTEM
MRAALS	MARINE REMOTE AREA APPROACH LANDING SYSTEM
MSL	MEAN SEA LEVEL
MWCS	MARINE WING COMMUNICATIONS SQUADRON
NAVSTAR	NAVIGATIONAL SATELLITE TRACKING AND RANGING
RLS	REMOTE LANDING SITE
RLST	REMOTE LANDING SITE TOWER
TACAN	TACTICAL AIR NAVIGATION
TACC	TACTICAL AIR COMMAND CENTER
TERPS	TERMINAL-INSTRUMENT PROCEDURES
VFR	VISUAL FLIGHT RULE

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